

Electronic Business

FOR MANAGEMENT IN ELECTRONICS COMPUTER & SYSTEMS COMPANIES

JULY 9, 1990

GROWTH BY RENEWAL

Motorola builds for the future

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The top ten high-tech attorneys

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George Fisher,
Motorola's CEO

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES — WORLDWIDE

VOL. 16, NO. 13

JULY 9, 1990



Marc Berlow

PAGE 30 Motorola chairman and CEO George Fisher: "We're like kids in a candy shop. There are so many opportunities, but we know we can't pursue everything."

COVER STORY/MOTOROLA

30 Motorola's surprising strength comes from growth by renewal

The word "renewal" is said so often by Motorola employees that it seems to be part of the corporate logo. The Motorola way to success is to build on its strengths, rather than to reposition or diversify. As Motorola tackles the 1990s, the company will continue to build on the success of its four traditional business sectors — communications, components, computers and controls.

Cover: Marc Berlow

UPDATE

12 Business Trends

New Philips chief challenged by lagging computer division; International trade Matsushita-style; Electronics firms still cautious on East Bloc; Slump stalls Britain's electronics market; NMB Semiconductor strikes a deal with Ramtron; Open Software Foundation and Unix International tussle over Unix users; Hitachi leads the way to the 64-megabit DRAM generation; Renewed China status brings sigh of relief; DAT recorders really are coming; Boston's Computer Museum brings technology to the masses.

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S3 markets flexible PC chipsets; Heart Data supplies storage for hungry Mac; Opal measures submicron chip features.

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Wilfred Corrigan, chairman and CEO of LSI Logic Corp. and chairman of the Semiconductor Industry Association, recalls the pioneering genius of Bob Noyce.

COVER STORY/MOTOROLA

30 Motorola's surprising strength comes from growth by renewal

Motorola sales came in at \$9.6 billion last year - a 17% increase over 1988 revenue. Chairman and CEO George M.C. Fisher sees "no reason why we can't maintain that pace throughout the 1990s." If that's so, annual Motorola revenue should double every five years.

32 The quality gospel, according to Motorola

As the first-ever winner of the Malcolm Baldrige National Quality Award in 1988, Motorola serves as the model for U.S. firms trying to do things right. Former chairman Robert Galvin says today's Motorola was really born during a corporate officers' meeting in 1979 - when quality took on a whole new meaning.

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For workers with an entrepreneurial interest, Motorola offers a powerful incentive: the New Enterprises unit, which searches for new technologies.

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Computer Associates International is openly fostering a self-deception. Despite surpassing the \$1 billion sales plateau in 1989, the independent software vendor still views itself as a small company. The company's challenge is to maintain the entrepreneurial spirit that built it.

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With their deep pockets, foreign companies — notably the British and French — are playing a leading role in shaping the U.S. technology landscape. Last year marked another year of big foreign deals.

48 Extra insurance coverage can ward off a nightmare

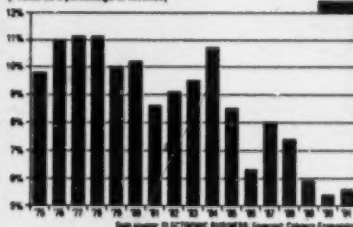
Just in case a product doesn't live up to customer expectations, electronics companies are protecting themselves by buying errors and omissions insurance. E&O policies supplement often vulnerable general product liability coverage — specifically covering damages caused by a product's failure to perform its intended function.



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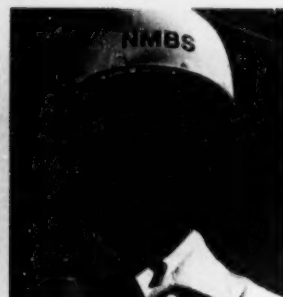
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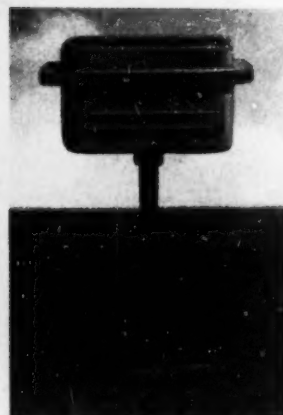
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PAGE 56 NMBS' Takumi Tamura.



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50 The top 10 lawyers in high tech

Who would have thought just a couple of decades ago that the adolescent electronics industry would become the nation's largest and fastest-growing industry? A few smart attorneys did. The likes of Sonsoni, Graev, Broutas and others moved out front to become experts in high-tech law as far back as the 1960s. We profile 10 of the best.

EUROPE BUSINESS

54 VLSI Technology's Euro-strategy: target ASICs

Munich-based Dieter Mezger works hard to make the U.S. management of VLSI Technology recognize the strategic importance of Europe, a market hungry for application-specific ICs. As vice president of VLSI's European operations, Mezger's arguments to his American bosses are backed by six years of sales success on two continents.

56 Tiny NMBS wants to conquer the world's DRAM markets

Targeting the fast-growing worldwide market for high-speed DRAMs, this fledgling Japanese company is racing to catch up with giants NEC, Toshiba and Hitachi. The goal of founder and president Takumi Tamura is to become the world's top maker of DRAMs by 1995.

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Digital signal processors are breaking new ground in consumer applications, luring companies to overcome software and hardware development problems. Applications supercharging demand include: car phones, and multiple-function printers/electronic mail/fax machines.

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 44 Cook Street, Denver, Colo. 80206
 (303) 388-4511
Total Circulation: 77,804

REPRINTS

ELECTRONIC BUSINESS articles are available on a custom printing basis at reasonable prices. Contact Andrea Marwitz, Cahners Reprint Service, Cahners Plaza, 1350 E. Youhy Ave., P.O. Box 5080, Des Plaines, Ill. 60018 (708) 635-8800. Electronic Business can be purchased on 35mm microfilm through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106.

How good is your company's lawyer?

No need to tell Analog Devices cofounder and chairman Ray Stata about the value to his company of one Paul Brountas. In fact, Stata probably would give Brountas a tip of the hat for his participation in the development of the electronics industry in and around Boston's Route 128.

But Brountas is no crack technologist. He's a seasoned, high-powered technology attorney, who, by the way, directed Michael Dukakis' bid for the White House in 1988. "We cut our teeth together," is how Stata describes to contributing editor Nancy Rutter his long relationship with Brountas of Hale and Dorr in Boston. For his part, Brountas recalls the early days of climbing a second-story fire escape in a run-down building in East Cambridge to visit Analog Devices' entrepreneurs.

Names like Brountas, Sonsoni and Graev are all featured in our profile this issue of 10 of high tech's most successful lawyers. Rutter examines how they built their success on the swift rise of the U.S. electronics industry. She says these top 10 attorneys have many characteristics in common: entrepreneurial, driven, high-spirited.

One of our benchmarks at ELECTRONIC BUSINESS is our rankings. Top 10 high-tech lawyers is a new one that we believe will arouse a lot of interest. It just might prompt some electronics executives to ask, "How good is my company's lawyer?" San Francisco-based Rutter specializes in writing about legal issues, venture capital and private companies. She has written for *Inc.* magazine and *The American Lawyer* newspaper group. She's working on other Top 10 lists for up-



Nancy Rutter, contributing editor

coming issues, including rankings of the top Wall Street analysts and the industry's top chief financial officers.

What's ahead for Motorola?

When thinking of U.S. electronics industry success stories, one must certainly consider Motorola. The company that was born years ago as Galvin Manufacturing to produce a device called a "battery eliminator" is now an unquestioned industry leader. In his cover story in this issue, contributing editor H. Garrett DeYoung delves into Motorola's past to get a notion of where it might be going in the future. One thing's for sure, DeYoung says: Motorola will not abandon the traditions that have made it a top company. That edict comes firsthand from the executives charged with moving Motorola forward — George Fisher, Bob and Chris Galvin and Gary Tooker.

MARVIN GREENE, section editor

ELECTRONIC BUSINESS® (ISSN 0163-6197) is published twice a month, except monthly in December, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President; Frank Stibley, Senior Vice President/General Manager, Boston Division; Jerry D. Neth, Senior Vice President/Publishing Operations; J.J. Walsh, Senior Vice President/Finance; Thomas J. Dellamaria, Senior Vice President/Production and Manufacturing; Ralph Knapp, Vice President/Human Resources. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5800. Telephone: (303) 388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. POSTMASTER: Send address corrections to ELECTRONIC BUSINESS® at the Denver address. ELECTRONIC BUSINESS® copyright 1990 by Reed Publishing USA; Ronald G. Segel, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Senior Vice President. Annual subscription rates for non-qualified people: USA, \$79.95; Canada, C \$99.95; other countries, \$120 per year; \$100, air mail surcharge. Except for special issues where price changes are indicated, single copies of regular issues are available for \$10.00 (USA, Canada/Mexico and foreign). Please address all subscription mail to Eric Schriener, 44 Cook Street, Denver, CO 80206-5800. Cahners Publishing Company, A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Research • Technology • Electronics • Computing • Printing • Publishing • Health Care • Foodservice • Packaging • Environmental Engineering • Manufacturing • Entertainment • Home Furnishings • Interior Design. Specialized Consumer Magazines: Child Care • Boating • Wedding Planning.

BPA AIP

our [Toshiba's] fundamental policy is to pursue semiconductor development in a manner that uses technology that both facilitates smooth transfer to production and can be employed in production.

"As an example of the production technology aspect, Toshiba is developing i-line and excimer laser lithography," he said. "Also, we are searching for the optimum memory cell technology by developing both trench and stack designs."

— T.S.

CHINA

Renewed China status brings sigh of relief

A SIGH OF RELIEF was breathed by U.S. electronics companies when President Bush announced recently he was renewing Most Favored Nation (MFN) status to China. Electronics companies that manufacture in or export from the communist nation applaud Bush's move, realizing that

if Congress tried to alter the MFN status, their investments there would be in jeopardy.

"Information technology has had a lot to do with the openness of China. To deprive the Chinese people a window to the world would not be right," says an official from Digital Equipment Corp. "Although the pace may not be to our liking, the Chinese will continue along their line of economic development."

Last year, U.S. electronics exports to China logged in at \$598 million, compared with China exports to the United States of \$1.4 billion. From 1988 to 1989, the U.S.-China electronics trade deficit grew from \$138 million to \$800 million, according to Electronic Industries Association data.

Yet U.S. electronics companies may not be out of the woods, as many in Congress are opposed to Bush's actions. A joint resolution of disapproval by Congress to override MFN status for China has been bandied about, but few think a two-third override vote can be mustered, especially on the Senate side.

PAM NAZARUK

CONSUMER ELECTRONICS

DAT recorders really are coming

THE DATs ARE coming, the DATs are coming.

Japan's Ministry of International Trade and Industry (MITI) has issued a directive to its electronics industry to incorporate a serial copy management system device (IC chip) in digital audio tape equipment. The SCMS scheme was approved at a meeting in Athens last year that was attended by international and U.S. recording associations and Japanese and European consumer electronics manufacturers.

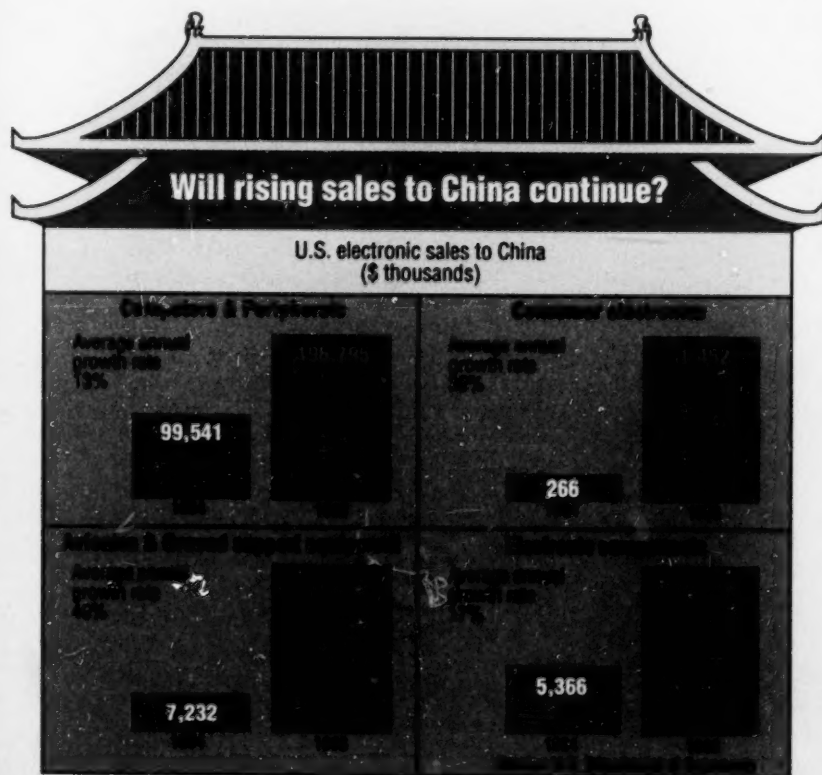
In the United States, Congress has held hearings on a bill with similar provisions. In Europe, the three concerned manufacturers — Philips, Thomson, and Grundig — will press the European Community to take a similar measure. A MITI official says a law is considered unnecessary in Japan. A directive issued in 1987 to build DATs to prevent the making of copies of CDs and prerecorded tape was obeyed by manufacturers.

The MITI official notes that SCMS enforcement must be provided by law or other means to relieve manufacturers of liability from antitrust law. Moreover, manufacturers have agreed neither to support nor oppose a levy for the purpose of paying the recording industry for the use of programming copied.

In Japan, DAT units built to conform to the previous MITI directive have almost disappeared from the market in anticipation of the new directive. Production was not large, about 35,000 units in 1988 and 47,000 last year. At last month's Summer Consumer Electronics Show in Chicago, Japanese companies announced plans to ship DAT recorders with the SCMS device, including Sony Corp., with a suggested retail price of \$900 to \$950 per unit.

The SCMS does not disallow copying on the basis of the sampling frequency of compact discs, but relies on a copy prevention flag added to their digital output by CD players. It allows first generation copies of CDs and prerecorded digital tape, but prevents second generation copies. It also allows second generation copies of analog sources.

CHARLES L. COHEN



Who in the world is investing in U.S. electronics?

U.S. electronics companies are soliciting foreign investors at an accelerating rate. And according to many, it is the best move they ever made

BY BRUCE C.P. RAYNER

Last year marked another year of big foreign deals in the U.S. high technology market. Multimillion dollar acquisitions and minority equity investments were commonplace as the industry restructured. With their deep pockets, foreign companies are playing a leading role in shaping the U.S. technology landscape.

Both the number and value of foreign investments in U.S. electronics companies rose in 1989, according to Broadview Associates, Fort Lee, N.J. Acquisitions of hardware companies, both domestic and foreign, rose from 216 deals in 1988 to 237 in 1989 while the total value rose from \$10.2 billion to \$11.4 billion. Foreign buyers accounted for one quarter of all the deals last year. "There is no reason why this level of activity will not continue," says Stephen Smith, a Broadview partner and head of the hardware practice for the firm.

Fifty percent of all foreign acquirers in 1989 were British or French, according to Broadview. Only 10% were Japanese, 10% were other Asian countries and 10% were West German or Swiss. Smith expects acquisitions by Asian companies to trend upward in coming years, particularly minority investments.

Those averages differ significantly from the ELECTRONIC BUSINESS list of the most acquisitive foreign companies in 1989. The list shows the Japanese to be leading the way into U.S. high technology companies. Of the top 30 foreign investors on the list,

the Japanese accounted for \$2.2 billion or 28% of the total investment in U.S. electronics companies last year.

Switzerland managed to pull off a respectable second place behind the Japanese with just one deal. Asea Brown Boveri, a powerhouse in industrial equipment, paid \$1.6 billion

fill gaps in their existing product lines. European companies, on the other hand, focus on market positioning and vertical marketing in their acquisitions.

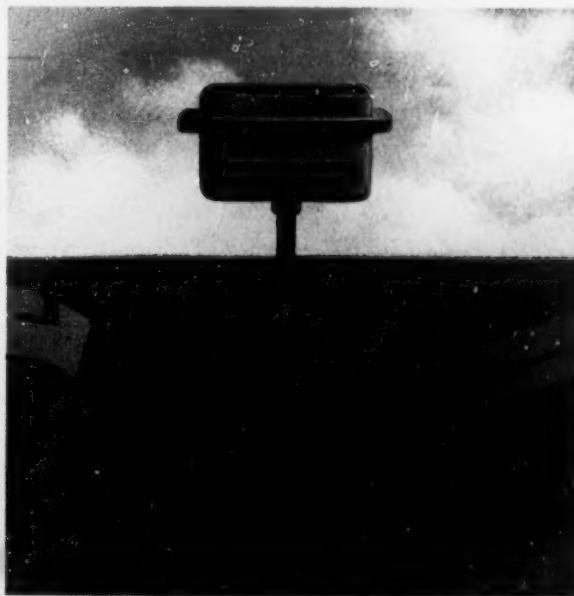
No segment of the electronics industry is untouched by foreign capital. Semiconductor and semiconductor equipment, computer and communications companies are all feeling the long arm of overseas investors.

Some go willingly, others are pushed. The common thread among most acquirers is a need for capital. "They need instant gratification," says Charles Coulter, general managing partner at American Research and Development Inc. in Boston.

For a growing number of overseas companies, the primary motivator for buying a U.S. company is to tap an existing infrastructure. That's why French computer maker Groupe Bull paid more than \$500 million for Zenith Data Systems last year. ZDS now has worldwide responsibility for personal computer product development and marketing for Bull.

Even though many industry watchers think most of the U.S. electronics industry restructuring is complete, no one is predicting a slowdown in the amount of foreign investment. The transnational corporation is just coming into its own as such giants as Siemens AG of West Germany and Sony Corp. of Japan chart their global courses for the 1990s.

What is more, barriers to foreign participation in the United States will continue to fall as the Cold War



for Combustion Engineering Inc. Germany, France and Britain followed on the list with investments of \$1.2 billion, \$1.1 billion and \$545 million, respectively. Other Asian companies combined accounted for \$762 million or about 10% of the top foreign dealmakers.

Reasons for foreign investments in the United States differ, says Smith. Japanese companies tend to look for product and technology companies to

FOREIGN INVESTMENT

Weinig's frustration is shared by

MANAGING RESOURCES

FOREIGN INVESTMENT

others. When Micro Mask Inc. went looking for a buyer in 1986 it was turned down by 65 U.S. companies, says Joseph Ross Jr., president and chief executive of the Sunnyvale, Calif.-based photo mask maker. It wasn't until 1989 that Ross struck a deal with \$800 million optics maker Hoya Corp. of Japan for \$26 million. "If Hoya had not come along, we might still be in business, but we'd be struggling," says Ross.

Differing strategies

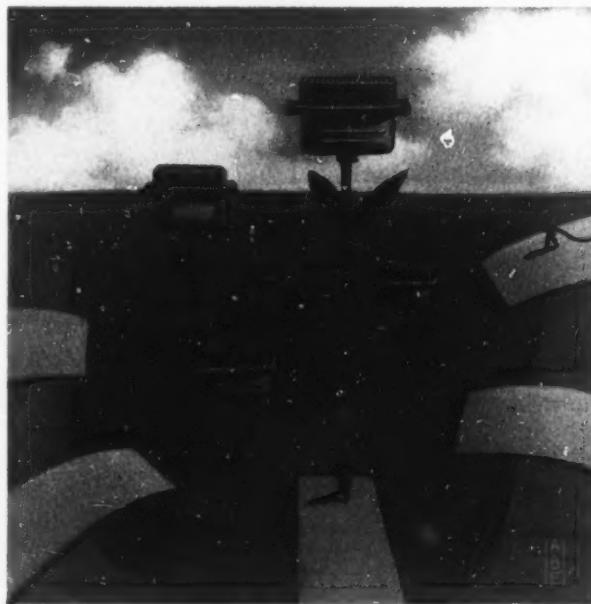
Out and out acquisition might generate the most publicity, but it is by no means the only method for gaining access into the U.S. electronics industry. Different companies, often from the same country, develop different strategies for growth. While some are prepared to spend millions for the big buyout, others prefer a low-profile minority investment tack.

For 100% investments, there is the question of how to incorporate the new acquisition into the company. The decision depends on the particular circumstances. When British-based Racal Electronics plc snatched up a handful of U.S. companies last year it folded them into its existing U.S. operations. Even the \$561 million Kyocera Corp. purchase of AVX Corp. resulted in AVX's sales and military operations being consolidated with Kyocera Northwest Inc. But France's Framatome SA's purchase of connector maker Burndy Corp. left the company intact.

"Burndy's internal decision making process remains unchanged," says Burndy's vice chairman and CEO Eliane Morin. Still, there are a few major changes. Top management at the company now has a say in the global coordination activities of the three Framatome companies: Burndy, Souriau and Jupiter. Also, Burndy went through a restructuring in 1989 that Morin says has "strengthened and improved the performance of our electronics business in the U.S."

In some situations, the new parent goes through more changes than the company being acquired. Toshiba

Corp.'s \$167.5 million acquisition of Dasonics Inc.'s magnetic resonance imaging (MRI) division resulted in a total restructuring of Toshiba's own medical electronics operations. Last November, Toshiba America MRI Inc. (TAMI) was created to combine Toshiba's existing MRI operation with that of Dasonics. Then in April, all marketing, sales and service activities were made part of Toshiba America Medical Systems Inc., leaving TAMI as an R&D and manufacturing company. Toshiba claims to now be the third largest MRI company in the world behind General Electric Co. and Siemens.



The Dasonics acquisition is only the beginning, says Takashi Hayashi, president of Toshiba America Medical Systems. Toshiba will build on its enhanced market presence, technology base and installed base by expanding local R&D, engineering and manufacturing, he says.

Investors like Japan's Fujitsu Ltd. and Kubota Ltd. have opted for the venture capital route. Kubota, a \$6 billion tractor maker, has been on a U.S. technology investing spree for the past four years — seeding start-ups and injecting later stage funds into companies with hot products. Investments include a total of \$68 million in Ardent Computer, \$25 million in Mips Computer Systems Inc., plus lesser amounts in six other

companies. Kubota's total investment to date is around \$200 million.

In the same vein, Fujitsu invested an estimated \$20 million for a 38% stake in Poquet Computer Corp. of Sunnyvale, Calif. The notebook computer company is planning on a monthly run rate of \$16 million which would put its annual sales at around \$190 million, says Stav Prodromou, Poquet's chief executive. In exchange for its investment, Fujitsu has the right to develop a Japanese version of the Poquet computer and will manufacture it in Japan. As part of its responsibility, Fujitsu will insure an uninterrupted supply of components to Poquet plus R&D funds for new products.

Fujitsu was Poquet's first choice for a partner, according to Prodromou. He approached Fujitsu Corp. at the highest levels looking for investment and within 30 days had a contract. "It dispels the myth that Japan moves slowly," he says.

While investing in existing companies is often the easiest entree into a market, there are foreign investors that insist on going it alone. After dabbling in acquisitions, South Korean-owned Samsung Information Systems America Inc. (SISA) decided to go with the green field approach, says Philip Vertin, senior vice president of sales and marketing. All SISA's

LANs and PCs are Korean made, but the company does have engineering capabilities in the United States and is in the process of building its sales force and a VAR network. "We are not in the acquisition business," insists Vertin.

The reason is SISA wants to grow a corporate culture not inherit one, says Vertin. Even though it is only one year old, SISA's sales hit \$110 million last year, and Vertin expects a doubling of sales this year and a doubling of head count helped along by \$15 million to \$20 million in investment. That might sound aggressive for the average \$100 million company but, supported by \$40 billion parent, Samsung Group, that kind of growth might be possible. □

VLSI Technology's Euro-strategy: target growing ASIC markets

But will its new emphasis on software and service head off increased competition in a market hungry for application-specific ICs and custom design automation?

BY BARBARA N. BERKMAN

The dozen yearly trips Dieter Mezger makes to the United States serve a critical purpose: Making the U.S. management of VLSI Technology Inc. recognize the strategic importance of the European market.

As vice president of VLSI's European operations in Munich, Mezger's arguments are backed by six years of success in Europe. Sales increased more than 50% in 1989, contributing almost 20% of revenue for San Jose-based VLSI. European operating income was \$3.9 million, on \$54.4 million in revenue.

Europe is a hungry market for application-specific ICs and for automation of the steps of IC design. VLSI designs and manufactures ASICs, application-specific standard products (ASSP) and high-speed memories. About 52% of its Europe business is in ASICs, with the remainder in ASSPs. Globally, 60% of VLSI's business is ASICs, with the rest in ASSPs.

Mezger's European strategy has focused on closer customer contact in the high-growth areas of telecommunications and data processing, forging an alliance with Dutch giant Philips and carefully tailoring customer service to European demands. By 1992, about 20% of VLSI's European products will be fabbed in Europe.

The European strategy is to invest into market positioning with a long-term view. "In Europe, you make money with strategy. In the United States, you make money with tactics," says Mezger.

Either way, VLSI is making money after a loss-making first quarter in 1989. It reported revenue of \$78.8 million and net income of \$2.3 million in the first quarter of 1990, compared to a net loss of \$6.2 million a year earlier.

Still, Europe's cutthroat ASIC market is dogged by price erosion of about 15% a year. The European market for gate arrays will be worth \$465 million in 1990, estimates Dataquest Europe, and will grow to \$1.1 billion by 1994. With a 3.2% market share, VLSI was Europe's 11th-largest supplier of CMOS gate arrays last year.

It also was Europe's second-ranked supplier of CMOS cell-based ICs, with an 11.6% share. The cell-based IC market will be worth \$684 million by year-end, and \$2.26 billion by 1994, predicts Dataquest.

This growth is fueling fierce competition. U.S. and Japanese suppliers are ramping up ASIC manufacturing capacity in Europe. The Europeans can no longer tout their local sourcing

capability while hiding other blemishes: inferior design, software tools and technology, and a sluggish start in the global merchant ASIC market. What is more, non-European ASIC suppliers are increasing their competitiveness in Europe with a round of new investments and alliances.

Against this competition, VLSI is bracing itself with its proprietary design tools, much favored by customers that want one company to take responsibility for their ASIC operation from design to the foundry. Vendors offering front-end tools that lay out the logic of the chip design are winning customers that want less proprietary design tools.

Customers forget VLSI does offer support for foundry-independent third-party platforms, says Douglas Fairbairn, VLSI's vice president in ASIC in San Jose. "The perceived notion is we do not do a good job of supporting other tools, when the largest engineering group in development is responsible for third-party platforms."

In Europe, says Mezger, VLSI "marketed by selling technology. We talked to the VP of technology, not the engineers, saying that we were selling leading technology." VLSI spent \$46.7 million on R&D in 1989, up 24% over 1988.

This technological edge has boosted VLSI's European market share. "They are among the very top in design tools," allows Ulrich Giese, assistant manager of product marketing at competitor NEC Electronics (Europe) GmbH in Dusseldorf. And from competitor AT&T: "They are doing a great job in supporting customers," says Victor Hrovat, director of ASIC marketing for AT&T Microelectronics in Munich.

The thrust of VLSI's European strategy is forging bonds with customers through some 10 design engi-



Dieter Mezger, vice president of VLSI's European operations: "In Europe, you make money with strategy. In the United States, you make money with tactics"

neers at each of three centers. The star of its European operation is a software R&D center in Sophia Antipolis, France, manned with 35 software engineers.

"The strategy we see emerging is customized ASIC capacity to get closer to applications unique to Europeans," says Jim Eastlake, a Dataquest analyst in London.

Telecommunications is among them. This fast-growth European market contributes less than 20% of VLSI's European revenue. But Mezger wants to push that percentage to 30% within three years. About 15% of European revenue is from industrial applications, and close to 50% is from computer applications.

Unlike the U.S. operation, VLSI's European unit is "leading the company in a telecommunications strategy, which might influence the total company," says Hans de Haan, Europe business manager in Munich. Last year, VLSI expanded applications in Europe for its ASIC software design tools by introducing new libraries tailored for telecom; it may soon add capability in digital signal processing. VLSI also is teaming up with potential telecom customers "with a bit more than normal cooperation than with our normal customers in ASICs," de Haan says.

The complexity of the chips, he adds, is "a real challenge for us." And tough competition is coming from AT&T and Texas Instruments. AT&T has more standard products than VLSI, and is pushing systems solutions with a broad communications product family. Two years ago, AT&T started supplying components for mobile phone handsets. TI is concentrating on CT-2 cordless technology, and is working on a chip with 130,000 usable gates for a European telecom customer.

First with 32-bit RISC

In data processing, Europe gave VLSI experience in next-generation designs that it can market globally, points out Dataquest's Eastlake. "VLSI started shipping silicon for the first RISC back in 1987, well before the MIPS

and Sparcs (architectures) came on." In 1986 VLSI introduced the industry's first 32-bit single chip RISC. Ing. C. Olivetti & Co. SpA of Italy used it in its Acorn microcomputer, "one of the biggest applications for RISC products in Europe."

Smaller European companies embraced VLSI as one of their own — small, aggressive and technologically advanced. "As a competitor, we see them when volumes are not of a tremendous size, and not at all in the consumer area," says NEC's Giese.

Europe's cutthroat ASIC market is dogged by price erosion of about 15% a year

But customer General Music SpA of Italy argues that as a medium-sized company, "they are more responsive to us," says Giacomo Bodini, vice president of engineering. "We consider their support better than that of TI, Austria Mikro Systeme, and for sure better than Plessey." Bodini claims that the reliability and performance of VLSI's design tools justifies pricing that can be 10% to 20% above the competitor's price for a finished product.

"The price of the chip is quite high

even in medium quantities" for 10,000 to 100,000 pieces, agrees Jean Pollard, president of Opsis SA, a \$200,000 French component maker and VLSI customer. "But I still believe they are the best for their very powerful design tools."

Still, VLSI Europe might be slow to fulfill chairman Alfred J. Stein's corporate strategy: pushing the company away from the short-run, high-cost ASIC business and into higher volume ASSPs. "I've been preaching to analysts we are far more than an ASIC company," says Stein. So far, some European giants have listened — Olivetti, France's Groupe Bull and more recently in telecom, Sweden's L.M. Ericsson and Britain's Orbitel Mobile Communications Ltd.

Philips alliance

A 1988 alliance gives Philips VLSI's high-end design tools and libraries, which it will use internally and adapt for its customers, in exchange for the use of its Hamburg, West Germany, wafer fab as a second source for ASICs and standard logic products.

In this alliance, Philips sent seven design engineers to VLSI's Sophia facility to develop libraries jointly for automotive and data processing applications. More than 20 software tools grew from the agreement so far. The two firms just started to customize circuits for a second project on desktop video applications.

VLSI won't comment on capacity from the Philips fab, which is qualifying a 1.5 micron CMOS process for production in the second quarter.

In March, the firms expanded the agreement to include a 1.0 micron process; they are discussing work beyond 1.0 micron.

Even with the Philips agreement, VLSI must defend itself against its competitors' charges that it is too dependent on ASICs and vendors offering broader solutions.

Yet to customers, VLSI's commitment to Europe is strong. Says General Music's Bodini: "They seem pretty keen to get business out of Europe in a massive way." □

Europe's ASIC leaders

The top 10 for CMOS cell-based ICs (captive and non-captive, 1989)
Sales (\$ millions)

1. Austria Mikro Systeme	30
2. VLSI Technology	27
3. Siemens	23
4. Texas Instruments	18
5. European Silicon Structures	17
6. Mietec	16
7. Marconi Electronic Devices	15
8. SGS-Thomson	11
9. Harris	10
10. LSI Logic	8

Source: Dataquest Europe

EDI: Still awaiting takeoff but already flying high

*EDI may not have sparked the paperless business era yet,
but this steadily rising market shows no signs of losing altitude*

BY PETER BURROWS

Despite predictions of rocketing growth for the past 15 years, the market for electronic data interchange (EDI) has settled into a strong and steadily rising growth curve. Rather than the 100%-plus annual growth rates predicted by those who envisioned an EDI-driven "paperless business" revolution, most analysts now expect long-term annual growth between 40% and 60%.

Torrey Byles, a market researcher with Mountain View, Calif.-based Input, suggests growth in the 40% range annually and predicts the market will grow from \$280 million in 1989 to \$1.4 billion by 1994.

Such long-term growth would be a cause for celebration in most industries, but these projections have a disappointing ring for many EDI veterans. "For years, I and everyone else has said 'this is the year EDI really takes off,'" says Ted Annis, CEO of Supply Tech Inc., a Southfield, Mich.-based supplier of EDI software that has enjoyed 40%-plus growth for much of its six-year history. "But I'm starting to think that the hockeystick kind of growth just doesn't exist. I'm still prepared for a growth rate in excess of 100%, but so far all the projections have been wrong."

It's hard to blame the pundits for their enthusiasm. EDI is a means for companies to exchange business forms electronically with their customers, suppliers and financial institutions — no paperwork necessary. Companies have been able to elec-

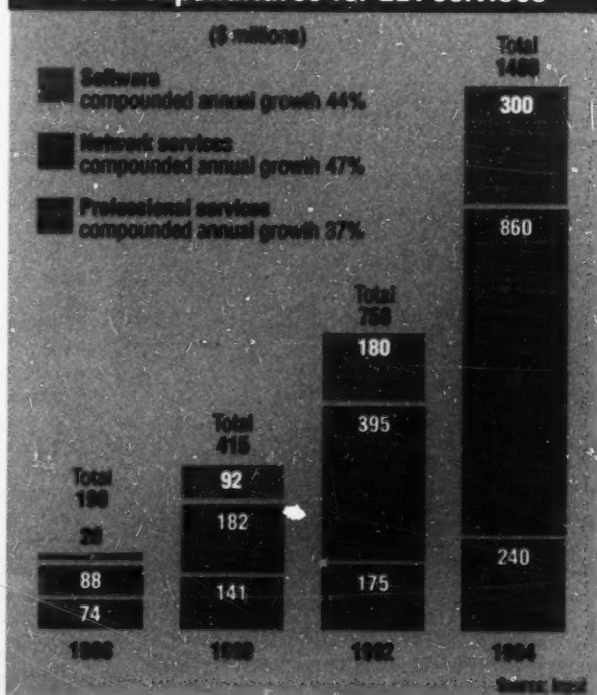
tronically transfer documents with selected trading partners for years, but EDI allows the use of standard formats for dealing with all such partners. Basically, internal versions of forms such as invoices, purchase orders, bills of lading and other documents are translated into these standard formats, transmitted over a wide area network, and retranslated and processed by their trading partners. Benefits of such systems include lower administrative costs, reduced postage and paper costs, more efficient use of clerical personnel, increased accuracy and easier implementation of just-in-time inventory control.

But the cheery projections for EDI's future, say industry veterans, focused too much on EDI's technological promise and ignored the high cost and hassle of implementing these communications systems. The Gartner Group Inc. of Stamford, Conn., recently polled 550 management information systems directors of companies that use EDI. The average investment in EDI, the poll found, was \$250,000. The transition from paper to EDI often took more than a year, and required changes to a wide range of existing business procedures and practices.

If long-term efficiency gains are not enough to drive EDI market growth, fear of losing the business of key trading partners is. Many suppliers that eschewed EDI in the past are now being dragged into the future by large, progressive customers who require or encourage them to use EDI. These include the Big Three automakers, oil companies, railroads, large retailers, and government agencies including the Department of Defense and the General Services Administration. Of the EDI users polled by Gartner Group, more than 70% said they had been coerced by major customers, says vice president and service director Dave Taylor.

"More and more companies and countries are getting involved with EDI," says Taylor. "A few years ago you had 4,000 or 5,000 companies at the pilot stage. Now, 1,000 of those companies are in production phase, and thousands more are in pi-

U.S. expenditures for EDI services



EDI's holy grail: International trade

Paperwork is always a headache for businesses, but the degree of difficulty rises exponentially when the trading partners happen to be located in different countries. Rather than just two management information systems departments wrangling, a bevy of other entities must be brought into the loop: customs houses, clearing houses, freight forwarders, governmental agencies and others.

That is why vendors of electronic data interchange, or EDI, services are looking abroad for their biggest opportunities. By transferring paperwork into electronic form, EDI can conceivably sidestep time zone and language problems and clear product for shipping faster than the paper-shufflers could ever hope to.

"Trade transportation is totally data intensive," says Guy Fisher, manager of EDI product marketing for GE Information Services of Rockville, Md., the market leader in EDI network services. "Ten years from

now, I have no doubt that it will all be handled electronically. It's just a question of how we get there."

International interest in EDI is already increasing, especially in Europe, where EDI is getting a boost from political pressure to streamline trade in preparation for the collapse of the trade barriers in 1992. According to the Gartner Group Inc., a Stamford, Conn.-based market research group, 78% of the \$115 million spent on EDI worldwide in 1988 was in the United States. But that percentage should fall to 55% by 1994, when total spending will reach \$2.1 billion. European EDI spending during that time will increase from \$22 million to \$607 million.

With such growth in the offing, international value-added network providers, or VANs, are scrambling to set up their EDI operations in Europe and elsewhere. GE Information Services, IBM and Infonet already have extensive global net-

works set up to provide a wide range of third-party services, such as telecopy and electronic mail, but the game, say observers, will come down to local service. "The world has accepted EDI," says Jose Collazo, president and chairman of El Segundo, Calif.-based Infonet Services Corp., which will start offering EDI services later this year. "We just have to provide the infrastructure to make it possible."

Another crucial catalyst for international EDI is a common set of standards. Currently, a standard developed under the auspices of the United Nations called EDIFACT is gaining momentum overseas, as well as in the United States. Earlier this year, the Data Interchange Standards Association announced plans to integrate the prevailing U.S. standard, the American National Standard Institute's X12 standard, with EDIFACT by 1994. "Once that happens," says Collazo, "EDI will really take off." □

lot mode." Included among these EDI users are over half of the *Fortune* 1000, says Vic Wheatman, program director of inter-enterprise systems at the Gartner Group.

Whether it is welcomed by or forced to the market, EDI will enjoy stable growth. "The real explosion is happening right now," says Ron Bamberg, a vice president with BT TymeNet, an international value-added network. "Every time a company moves to EDI, it has reached out and touched a bunch of other companies. Then those companies turn around and touch someone else — the industry kind of grows on its own inertia."

And recent trends indicate that companies in many industries have accepted EDI as a cost of doing business. Trade groups in more than 20 industries are working within EDI standards to develop common formats for frequently used documents. These groups are organizing trade shows and user conferences at an increasing clip. Also, an industry of EDI training companies has sprung up.

As with any pyramid scheme, there can be lots of winners. The numbers, according to Input, are as follows:

- EDI-related revenue for the value-

added network providers, or VANS, that supply the data communications systems on which these electronic documents travel is expected to increase from \$182 million this year to \$860 million in 1994.

- Revenue for the software houses that make the programs to translate in-house documents to standard EDI formats and back again is expected to rise from \$92 million this year to \$300 million in 1994.

- Revenue for the consulting firms, VANs and software houses who help companies with the arduous transition to EDI is expected to increase from \$141 million to \$240 million.

EDI will drive a certain amount of hardware sales as well, although this windfall is difficult to isolate from other communications-related hardware purchases. "Hub" accounts such as General Motors Corp. and Hewlett-Packard Co. require a host computer — usually a mainframe — to run EDI, while most of the "spokes" that implement EDI as a result of the demands of these industry giants typically run on a PC. As such, EDI promises to extend the reach of the PC to a wide range of mom and pop shops, from trucking

depots to gas stations to retail outlets.

EDI also requires that computers be equipped with modems or other forms of communications hardware. CLEO Communications of Ann Arbor, Mich., has isolated EDI as a prime market for its bisynchronous communications boards. By selling the boards to software companies that act as OEMs to the thousands of suppliers that serve the automakers, EDI has accounted for "a major slice" of the company's revenue, according to president Don Redding.

As companies get past the difficulties of EDI implementation and recognize its benefits, they will continue to drive the industry's steady growth. "You have to go into debt, usually for two or three years, to get any benefit out of EDI," says Gartner Group's Taylor, "but once you get it going, you're going to be net positive." While 70% of the 550 companies polled by the group reported an average loss of \$100,000, those that reported net gains were in the black by an average of \$1 million. "A lot of companies are in the hole right now, so we expect people to question the value of EDI," says Taylor. "But within a few years, that will all turn around." □

DSP technology roars into consumer markets

Digital signal processors are breaking new ground in consumer applications, luring companies to overcome software and hardware development problems

Despite some roadblocks, new consumer applications are paving a superhighway for digital signal processing chips (DSPs). Applications as diverse as car phones, high-speed, high-definition graphics systems and multiple-function printers/electronic mail/fax machines are supercharging demand for DSP chips.

DSPs are chips that translate analog signals to a digital format, thus providing the interface between the real world and computers. Once seen as an arcane discipline of algorithmic complexities, DSP chips are still considered a bit oddball perhaps, but well worth the trouble they inevitably create for designers.

The processing these chips depend on complex algorithmic software, whose development cost has been a market barrier in the past. Companies cannot predict how long it will take engineers to figure out the complicated equations, and developers experienced in DSP software design are not a common breed — all of which drives costs up.

Additionally, as high speed applications demand increasingly precise timing, the chips must become increasingly fast, calculating numeric functions down to the split nanosecond. Despite these barriers, tantalizing applications with large volume potential are luring companies into the DSP market.

DSPs — fixed or floating?

From a market perspective, DSPs are usually divided into fixed-point and floating-point devices. A third category are called function- and algorithm-specific integrated circuits (FASICs). These chips are not usually called DSPs, but they do perform DSP functions within devices such as modems.

Telecommunications, still the larg-

est market for DSP chips, with 43% of the market in 1989, employs the older fixed-point DSP technology. Image processing, which uses floating point, accounted for 23% of the total worldwide market last year, according to Will Strauss, president of Forward Concepts Co., a market research firm in Tempe, Ariz.

Another growth area for DSPs is speech processing, which held about 10% of the market last year. DSPs are also used in military applications such as sonar, image, and radar processing, as well as missile guidance and navigation.

The fastest growth is in floating-point DSPs, used for the intensive number crunching needed for graphics in the latest generation of personal

and desktop computers. Because end users are demanding greater graphics capabilities, sales of floating-point DSPs have doubled in the past year and are expected to continue to increase rapidly.

In 1989 the floating-point market stood at only \$10 million compared with the \$260 million generated by fixed-point DSP chips. By 1995 the floating-point market is projected to reach \$400 million and the fixed-point market \$1.394 billion, according to Strauss.

The market for floating-point DSPs will grow at an 85% compound annual rate between 1989 and 1995, Strauss projects. Fixed-point DSP sales will grow at an also healthy 32% annual rate during the same period, he says.

Used in high-volume applications such as compact disks and modems, FASICs rivaled the sales of general-purpose DSP chips with about \$260 million in 1989, Strauss estimates. By the end of this year the FASIC market will grow to \$383 million as applications such as speech synthesis increase, he projects.

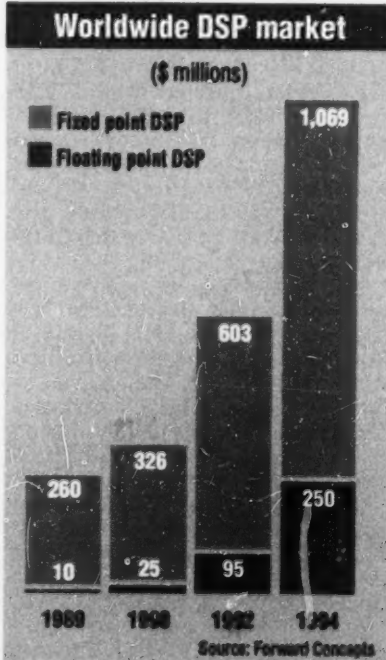
Although the biggest market for DSP chips is in the United States, growth is shifting to the Far East, particularly Taiwan, Strauss says, as high-volume consumer applications increase there.

Texas Instruments dominates

Texas Instruments Inc. is the dominant player in the DSP market, with 61.1% of sales last year. The company pioneered DSP commercialization with its speech synthesis chips.

Following TI are several contenders with much smaller market shares, headed by NEC, the second largest player in the market with its 9.3% share; and AT&T, which specializes in telecommunications chips and is third at 4.4%.

BY TERI SPRACLAND



No wonder TI sees little reason to think it will lose its market leadership anytime soon. In fact, the company plans to introduce 25 DSP chips this year, far more than any other DSP contender currently has on the market, according to Rick Rinehart, TI's floating-point DSP program manager.

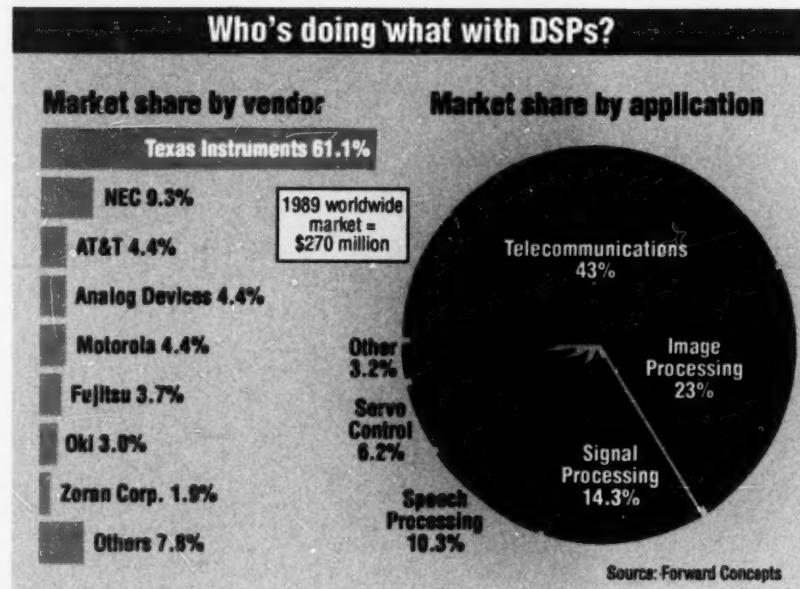
More than 200 universities are even teaching the gospel of DSP according to TI, since the 1986 publication of a textbook based on the family of DSP chips. Everything from hearing aids to talking dolls to weather satellites now incorporates TI's DSP chips.

But Rinehart is frustrated that market applications are not taking full advantage of DSP's potential. He attributes the lag to the time it takes for consumer markets to absorb new ideas.

In the meantime TI continues to push the price down to make DSP chips more attractive to original equipment manufacturers (OEMs). Saturation, even in common items such as answering machines, won't be a problem, he claims, because consumers keep replacing aging machines with newer models.

"There is a market explosion for uses of DSP," Rinehart says. "The consumer world just hasn't absorbed all the functionality yet." As costs continue to drop, new applications surface. Two years ago TI's premier DSP chip cost \$1,300; today it is \$150. "In two years, it will cost \$50," Rinehart says. "And that chip has about one-fourth the math processing capability of a Cray supercomputer." As third-party developers build software libraries to tackle the algorithm equations, more designs will be produced, he says. "We have about 100 third parties supporting TI's DSP work," he says. "It's taking the mystique out of DSP design."

One such developer is The DSP Group Inc. in Emeryville, Calif. This company focuses on providing chipsets (which TI manufactures) for transcription/dictation equipment, fax machines and cellular telephone, telephone answering and cordless telephone equipment, says Robert Goff, president and chief operating officer. The customized subsystem, which combines application-specific integrated circuits, a DSP device and its proprietary algorithms, is then sold to OEMs as the core for new



product development.

Automotive uses are growing in acceptance, Goff says. For example, TI uses DSPs in active suspension, adaptive ride, engine management, antiskid braking and sound systems.

The growing demand for DSP chips for cellular digital radio is another strong market, market re-

The market for DSP chips is shifting from the United States to the Far East

searcher Strauss says. Car phones are likely to use more complex DSP chips, as speech recognition and echo cancellation are implemented, he says.

DSP development will allow concepts that were once thought to be futuristic fantasies, such as video-phones, to become reality. "A video-phone would take a DSP chip about three times as fast as the current-generation chip," Rinehart says. Two keys to market development are lower chip cost and increased performance — the classic semiconductor industry approach.

In the past general-purpose microprocessor units (MPUs) sometimes performed DSP functions, and some

DSP applications that do not require real-time action continue to use them. In general, lower DSP costs are now pushing application developers away from microprocessors, Strauss says.

However, since DSPs are basically microprocessors that perform a limited number of numeric functions very quickly, MPUs could well reclaim DSP applications someday. At some point it becomes a question of semantics as to whether a microprocessor should be considered first as a DSP or as simply a microprocessor.

32-bit DSPs

Already companies such as Motorola Inc. and National Semiconductor Corp. are starting to design their 32-bit microprocessors to perform specific tasks in image processing. National's pride and joy these days is its work in 32-bit embedded control applications in laser printers. Some companies are introducing so-called multimedia chips, which combine several functions, such as speech and data transmission; one such chip is the CG Series from National.

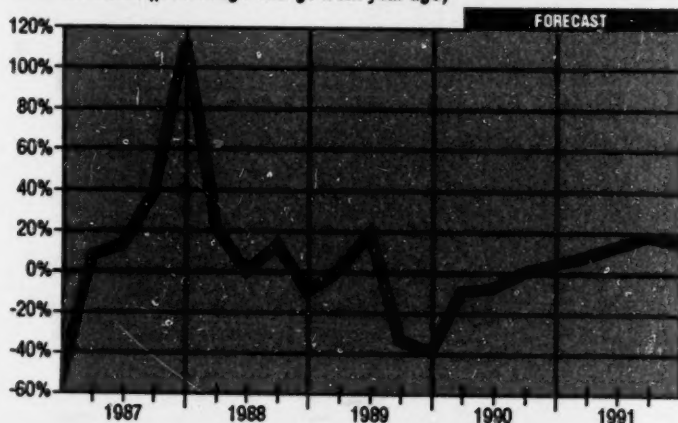
"We're integrating DSP functions onto our core MPU chip," says Russ Johnsen, director of National's imaging group. One chip will be fully programmable to handle fax, printer, digital voice messaging and data modem functions, he says. "It becomes a multifunctional peripheral." □

BUSINESS BAROMETER

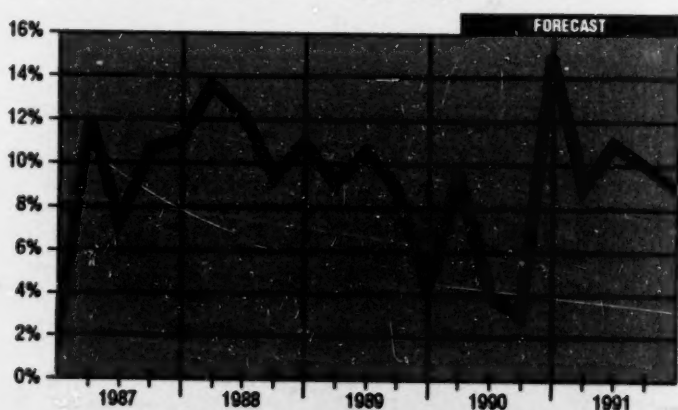
FORECASTS FOR ELECTRONICS, COMPUTERS AND SYSTEMS

ELECTRONIC BUSINESS indexes

Profits Index (percentage change from year ago)



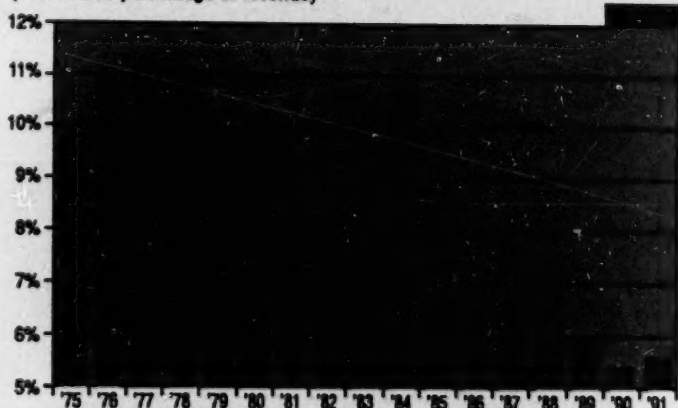
Revenue Index (percentage change from year ago)



Data source: ELECTRONIC BUSINESS; Forecast: Cahners Economics

Profitability index

(Profits as a percentage of revenue)



Data source: ELECTRONIC BUSINESS; Forecast: Cahners Economics

Profits continue to slide as revenue rebounds

There is both good news and bad news in last quarter's revenue and profit growth. First the good news. The rate of decline of the ELECTRONIC BUSINESS Profit Index has finally bottomed out and the Revenue Index has begun to rise strongly.

The bad news: Profits still have a long way to go before they turn up again. The profit index growth was negative in the first quarter of 1990 relative to profits in the first quarter of 1989 for the third quarter in a row. But last quarter's 9% drop was less severe than either of the previous two quarters' performance, indicating that profit growth could soon be turning positive. Both the profit index and the revenue index are derived from financial performance of 16 major U.S. electronics companies.

The revenue index posted solid growth last quarter after slowing in the fourth quarter of 1989. Revenue rose 9.6% in the first quarter of 1990 above revenue in the first quarter of 1989. That is twice the growth rate posted in the final quarter of last year.

The obvious consequence of falling profits and increasing revenue is a lower profit margin. Electronics industry profits as a share of revenue have been steadily shrinking over the past few years. In the first quarter of 1990, the ratio fell to 5.6%, an all-time low. Profits as a share of revenue averaged only 5.9% in 1989, down from 7.4% in 1988 and 8.0% in 1987. Between 1975 and 1984, profits as a share of revenue averaged 10.1%.

Cahners Economics' electronics profit and revenue forecast suggests the profit margin ratio will drop to 5.4% in 1990 and will remain virtually unchanged at 5.6% in 1991. Electronics industry profits are expected to post 13% growth in 1991, but relative to revenue growth, profit gains will continue to be less than satisfactory. Cahners Economics expects the ratio of profits to revenue to continue to decline in the 1990s. For the decade, expect a ratio between 5% and 6%.

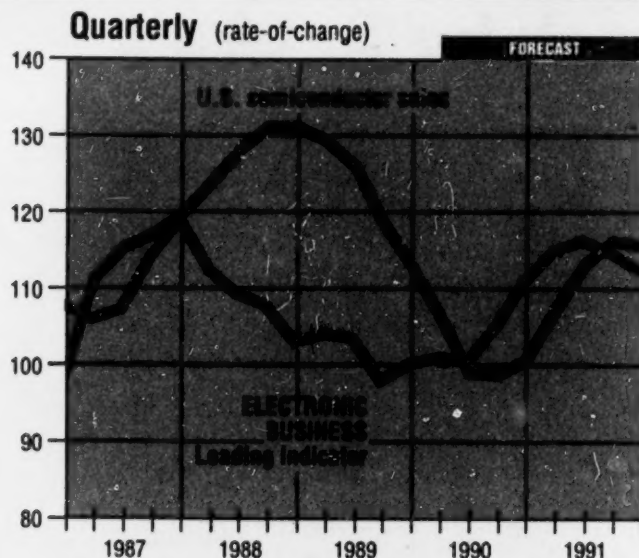
None of this news is unexpected. Profit margins typically shrink as an industry matures and there's no doubt that electronics is a more mature industry today than it was even in the early 1980s. As the U.S. companies represented in the ELECTRONIC BUSINESS index garner more revenue abroad, profit margins also tighten because of rising marketing costs. While this secular trend in profits takes its toll, the ups and downs of the electronics industry business cycle will become even more critical to our forecast of the bottom line.

ELIZABETH B. BAATZ, Cahners Economics

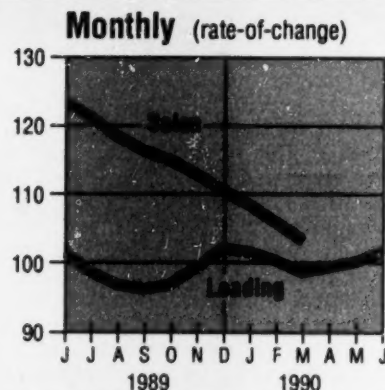
BUSINESS BAROMETER

FORECASTS FOR ELECTRONICS, COMPUTERS AND SYSTEMS

ELECTRONIC BUSINESS leading indicator



To obtain your complimentary copy of a 12-page background paper on the ELECTRONIC BUSINESS leading indicator, please contact Linda Spiller at Cahners Publishing Company, 275 Washington St., Newton, MA 02158-1630, USA, telephone (617) 558-4397, fax (617) 558-4402.



The ELECTRONIC BUSINESS leading indicator remained fairly steady at 99.5 in April, up from a revised 99 in March. Slight upward movement in the indicator was a result of small changes in all of the pieces. The indicator hit bottom at 96.3 last September. Because the indicator leads the electronics equipment industries by about one year, expect to see a turnaround in the electronics industry this fall. Cahners Economics predicts that the indicator will push up beyond 110 during the second half of this year before reaching another peak in June 1991.

Source: Cahners Economics

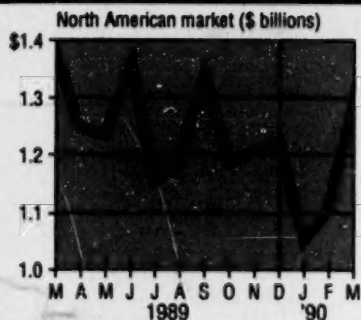
Electronics industry indicators this month

	Latest month	Previous month	Year ago	1989 average
ELECTRONIC BUSINESS leading indicator (rate-of-change, Apr.)	99.5	99.0	103.7	100.9
U.S. semiconductor bookings (\$ millions, 3-month average, Apr.)	1,279	1,267	1,315	1,205
Weekly hours of semiconductor production workers (monthly average, Mar.)	40.7	40.6	39.5	40.1
Electronic component leadtime index (1977=100, May)	87.3	82.9	110.6	102.5
S&P's semiconductor stock price index (1970=10, monthly average, Apr.)	67.8	67.0	51.3	54.7
Change in electronic components inventories (\$ millions, SA, Mar.)	+178	+5	+10	-12.8
Contracts and orders for plant and equipment (\$ billions, SA, Mar.)	45.5	40.0	42.6	43.4

SA = seasonally adjusted, all other data are not seasonally adjusted

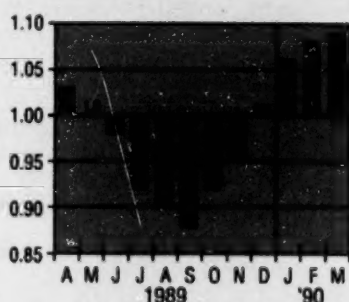
Sources: Semiconductor Industry Association, U.S. Bureau of Labor Statistics, Electronics Purchasing magazine, Standard & Poor's, U.S. Commerce Department, U.S. Bureau of Economic Analysis

Semiconductor sales



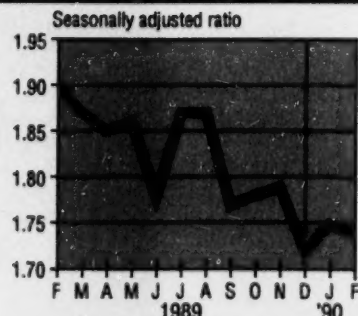
Source: Semiconductor Industry Association

Semiconductor book-to-bill ratio



Source: Semiconductor Industry Association

Component inventory-to-shipments



Source: U.S. Commerce Department